Remarks/Arguments

Claims 1-5 and 7-14 stand rejected.

Section 103 Rejections:

Claims 1-5 and 7-14 have been rejected as obvious in view of Borg and Hynecek. Applicants respectfully submit that this rejection is overcome for the reasons set forth below.

Amended claim 1 includes features which are not suggested by the cited references, namely:

- . . .
- **the video amplifiers sample in series, one at a time, a video voltage from each pixel in the row of pixels,**
- . . .
- the [single] reference amplifier **separately** samples **in series, one at a time**, the respective unique reference voltage for each pixel in the row of pixels, as each pixel in the row of pixels is sampled by a respective one of the video amplifiers, and
- **a differential amplifier receives both, the video voltage and the respective unique reference voltage, sampled in series, from each pixel in the row of pixels, and provides, in series, a corresponding differential voltage output**.

Basis for amended claim 1 may be seen, for example, in FIGS. 1 and 3. As shown in FIG. 1, video amplifiers 18-36 sample, in series, one at a time, the video voltage from each pixel in a row of pixels. This serial sampling may be seen in FIG. 3, with the sequential selection of columns 1, 2, 3, etc., using column select signals 74, 78, 80, etc. Reference amplifier 38 seperately samples, in series, one at a time, a respective unique reference voltage for each pixel in the row of pixels, as each pixel in the row of pixels is sampled by one of the video amplifiers. Such sampling is accomplished using reference sample signal 76. It will be appreciated that a unique reference voltage is sampled during each ON period (logic level 1 in FIG. 3) of the column select signals.

Furthermore, differential amplifier 16 in FIG. 1 receives both, each video voltage and each corresponding unique reference voltage, as inputs to the differential amplifier. Note that video lane 51 provides one input and reference lane 52 provides the second input. The

differential amplifier 16 then provides a sequence of differential voltage outputs corresponding to the sequence of input voltages.

Borg discloses a pixel column amplifier as shown in Fig. 1. As shown, Borg requires that all the pixels in a line, be sampled at the same time. In addition, Borg requires that the same reference voltage be used for each pixel in a row. Therefore, Borg cannot sample a unique reference voltage for each pixel in the row of pixels, as required by claim 1.

Borg does **not** suggest, **at least**, the following features recited in amended claim 1: **(a)** that the video amplifiers sample in series, one at a time, a video voltage from each pixel in a row of pixels and **(b)** that the reference amplifier separately sample, in series, one at a time, a respective unique reference voltage for each pixel in a row of pixels, as each pixel in the row of pixels is sampled by the video amplifiers. In addition, Borg does **not** suggest the following newly added features of claim 1, namely, **(c)** that a differential amplifier receive both, the video voltage and the respective unique reference voltage, sampled in series, and **(d)** that the differential amplifier provide, in series, one at a time, a corresponding differential voltage output.

The Office Action admits that Borg fails to disclose a reference circuit that generates a respective unique reference voltage, and a reference amplifier which samples the respective unique reference voltage for each pixel in the row of pixels, as each pixel in the row of pixels is sampled by a respective one of the video amplifiers (items (a) and (b) above).

Hynecek discloses an image sensor that provides digital counts from a comparator for each pixel. As charge accumulates on a pixel, the pixel output increases until a reference voltage level is reached. When the reference voltage level is reached, as shown in Fig. 4A, the pixel output is reset. This process is repeated several times for each frame. Accordingly, as shown in Fig. 3, a digital output, based on a comparison performed by comparator 307, is provided to horizontal shift register 319. As further described, in column 4, lines 24-30, output signals, representing intensities of pixels, are computed using a "time ratio" (which is time interval 410 divided by time interval 409). This "time ratio" is used by Hynecek, because the "time ratio" is independent of reference level 402 (which varies for each pixel). This "time ratio" may be used to compute pixel output signals, when and if RF generator 315 provides a reference voltage which is always decreasing linearly over time.

Furthermore, as described in column 5, lines 4-9, at the end of each frame cycle, memory locations for each pixel contains digital counts corresponding to different time periods shown in Fig. 4. Finally, an output voltage, which represents a pixel's intensity, is obtained by scanning memory blocks 500 (Fig. 5), pixel by pixel, and calculating an output for each pixel

from the count data contained in memory blocks 500. This complicated system is used by Hynecek, so that he may determine pixel intensities without being sensitive to variations in dark noise between one pixel and another.

Accordingly, Hynecek discloses a system which depends on a **decreasing threshold value generated by RF generator 315**. Moreover, Hynecek discloses using a "**time ratio**" to compute a pixel voltage from each pixel. **Hynacek does not disclose sampling a reference voltage for each pixel, nor sampling a video voltage for each pixel.**

More specifically, Hynecek does **not** suggest several features recited in amended claim 1. For example, Hynacek does **not** suggest **(a)** that the video amplifiers sample, in series, one at a time, a video voltage from each pixel in the row of pixels. In addition, Hynecek does **not** suggest **(b)** a reference amplifier which separately samples, in series, one at a time, a respective unique reference voltage for each pixel in the row of pixels. Further yet, Hynecek does **not** suggest the newly added features of claim 1, namely **(c)** that a differential amplifier receive both, a video voltage and a corresponding unique reference voltage and **(d)** that the differential amplifier provide, in series, one at a time, a corresponding differential voltage output. It is respectfully submitted that the system disclosed by Hynecek is completely different from the system recited in amended claim 1.

Since neither Borg, nor Hynecek discloses several of the same features of amended claim 1, namely features (a) through (d) enumerated above, claim 1 is patentable over the cited references. Favorable reconsideration is respectfully requested for amended claim 1.

Although not the same, independent claims 5, 10 and 13 include features similar to amended claim 1. Claims 5, 10 and 13 are, therefore, not subject to rejection in view of the cited references for the same reasons set forth above for amended claim 1. Favorable reconsideration is respectfully requested.

Dependent claims 2-4 depend from amended claim 1. Dependent claims 7-9 depend from amended claim 5. Dependent claims 11-12 depend from amended claim 10. Dependent claim 14 depends from amended claim 13. These dependent claims, therefore, are not subject to rejection in view of the cited references for at least the same reasons set forth above for amended claim 1.

Conclusion

The application is in condition for allowance.

Respectfully submitted,

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